Technical Memorandum

To: **D. Mark Nesbit**
Resident Engineer
Warrenton Residency

From: **Md Atiquzzaman**
Traffic Engineer
Culpeper District Traffic Engineering

Date: **July 28, 2021**

Re: **Safety Review for the intersection of Rte. 17 (Winchester Rd./James Madison Hwy.) and Rte. 245 (Old Tavern Rd.)/Rte. 703 (Enon Church Rd.)**

Background

Culpeper District Traffic Engineering section received the request from Warrenton Residency to conduct a safety review at the intersection of Rte. 17 (Winchester Rd./James Madison Hwy.) and Rte. 245 (Old Tavern Rd.)/Rte. 703 (Enon Church Rd.). This intersection is #66 in the list of top potential safety improvement (PSI) intersections in Culpeper District.

Existing Conditions

The study intersection is a traditional four-legged, two-way stop controlled intersection. The major road (i.e., Rte. 17) approaches are free-flow movements and runs north to south. On the other hand, the minor road (i.e., Rte. 245/Rte. 703) approaches are stop controlled and runs east to west.

Both approaches of Rte. 17 have one left-turn lane, two through lanes, and one right-turn lane. The existing lane widths are approximately 12 ft. with 4-6 ft. shoulder on the outside edge and 2-3 ft. shoulder on the median side. The average daily traffic (ADT) on Rte. 17 is approximately 21,000 vehicles per day (vpd). The posted speed limit is 55 mph.

Both Rte. 245 and Rte. 703 approaches have only one shared left-through-right lane approaching the intersection. The existing travel lane on Rte. 245 is approximately 10 ft. with 1-2 ft. paved shoulders. Rte. 703 has no centerline marking currently. The available pavement width is approximately 22 ft. on this approach. The ADT on Rte. 245 and Rte. 703 are 3,100 vpd and 120 vpd, respectively. Rte. 245 is currently posted at 45 mph and Rte. 703 is unposted.

Crash Summary

Crash data was collected from VDOT's PowerBi database for a period of five years from February 1, 2016 to January 31, 2021. There was a total of 21 crashes during this period within a 500 ft. radius of the study intersection. A summary of the crash data is shown in Table 1. Approximately 67% (14 out of 21) of the crashes were found to be angle collisions. There were two fatal crashes during the study period. Both of them occurred from angle collisions.

Table 1. Summary of five years crash data (February 1, 2016 to January 31, 2021)

Collision Type	Total	Total (%)	Crash Severity			Lighting Condition		Road Surface Condition		Alcohol/Drug Related?		Speeding Related?	
			Fatal	Injury	PDO	Daylight	Darkness	Dry	Wet	Yes	No	Yes	No
Rear End	4	19%	0	0	4	2	2	3	1	0	4	2	2
Angle	14	67%	2	5	7	11	3	13	1	0	14	2	12
Sideswipe - Same Direction	1	5%	0	0	1	1	0	1	0	0	1	0	1
Fixed Object - Off Road	1	5%	0	1	0	1	0	1	0	0	1	0	1
Deer/Other Animal	1	5%	0	0	1	0	1	1	0	0	1	0	1
Total	**21**		**2**	**6**	**13**	**15**	**6**	**19**	**2**	**0**	**21**	**4**	**17**
Total (%)	**100%**	**100%**	**9.5%**	**28.6%**	**61.9%**	**71.4%**	**28.6%**	**90.5%**	**9.5%**	**0.0%**	**100.0%**	**19.0%**	**81.0%**

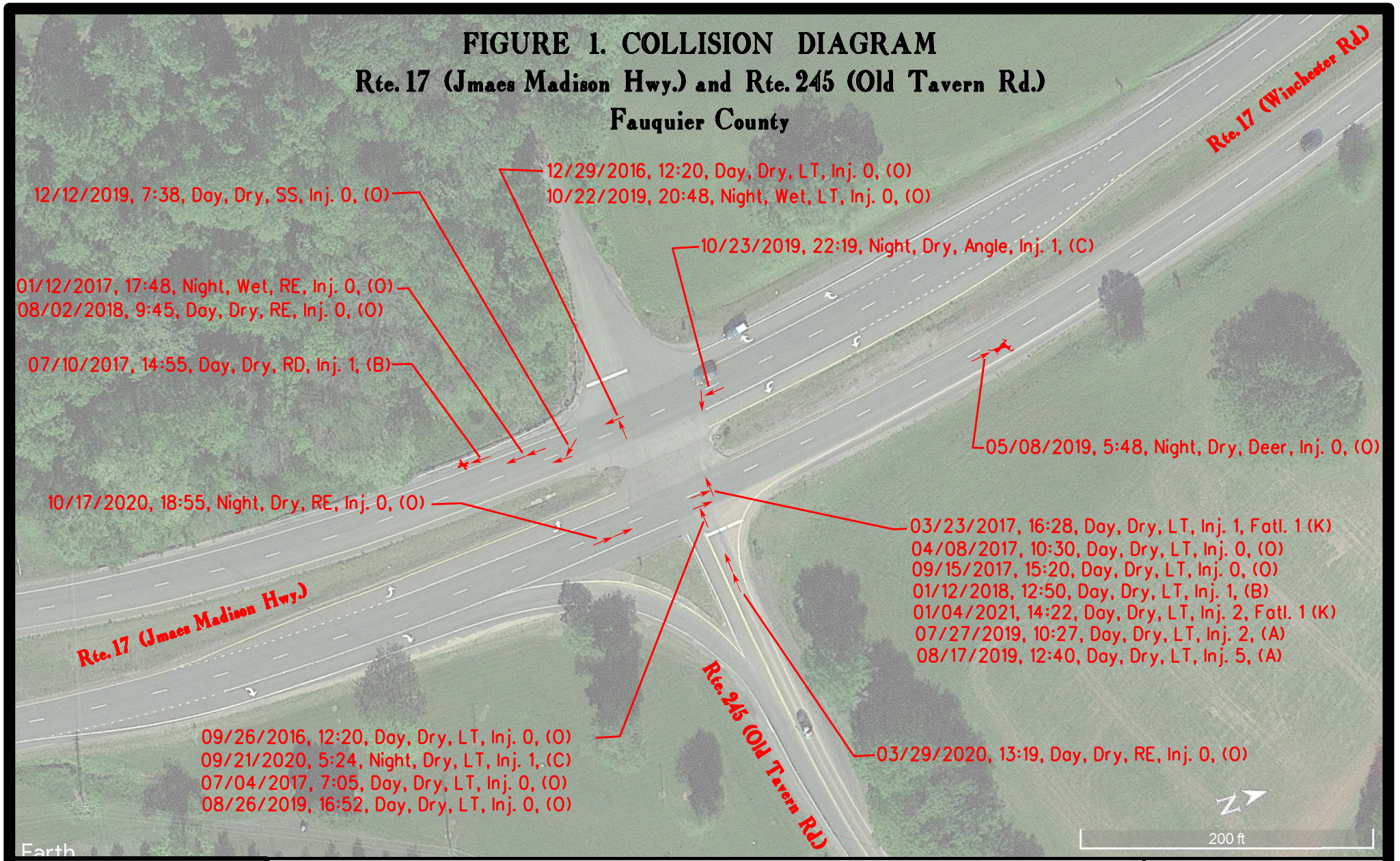
To further investigate the nature of the crashes, collision diagram has been prepared for the study intersection as shown in Figure 1. The collision diagram shows that a majority of the angle crashes (i.e. 11 out of 14) occurred between left-turning movements from Rte. 245 and through movements on Rte. 17 northbound. Additionally, two angle crashes occurred between left-turning movements from Rte. 245 and through movements on Rte. 17 southbound. Therefore, the left-turning movement from Rte. 245 contributed to approximately 93% (13 out of 14) of the angle crashes or 62% of the total crashes. Additionally, both of the fatal crashes during the study period occurred between left-turning movements from Rte. 245 and through movements on Rte. 17 northbound.

Based on the available crash data and collision diagram, no other recognizable crash pattern was observed at the study intersection during the five years period from February 1, 2016 to January 31, 2021.

FIGURE 1. COLLISION DIAGRAM

Rte. 17 (Jmaes Madison Hwy.) and Rte. 245 (Old Tavern Rd.)

Fauquier County



VDOT

CULPEPER DISTRIC
TRAFFIC ENGINEERING

1601 ORANGE ROAD
CULPEPER, VA 22701

NOT TO SCALE

YR	2016	2017	2018	2019	2020	2021	TOTAL
ANGLE	0	0	0	1	0	0	1
RT	0	0	0	0	0	0	0
LT	2	4	1	4	1	1	13
SS	0	0	0	1	0	0	1
RD	0	1	0	0	0	0	1
RE	0	1	1	0	2	0	4
TOTAL	2	6	2	6	3	1	20

Day – 15 Night – 6

Dry – 19 Wet/Icy/Snowy – 2

SEVERITY	2016	2017	2018	2019	2020	2021	TOTAL
K	0	1	0	0	0	1	2
A	0	0	0	2	0	0	2
B	0	1	1	0	0	0	2
C	0	0	0	1	1	0	2
O	2	4	1	4	2	0	13

*Five years of Crash Data from May 1st, 2016 thru April 30, 2021 was examined for this report.

LEGEND

Angle - Through
RT - Right Turn
LT - Left Turn
SS - Side Swipe
RD - Road Departurex
RE - Rear End
→ - Vehicle
- Deer

June 22, 2021

Signal Warrant Analysis

A traffic signal warrant analysis was conducted for the study intersection using 12-hours turning movement counts collected on January 20, 2021 from 6:00 AM – 6:00 PM. Based on the collected data, the study intersection does not meet the volume criteria stated in Warrants 1-3 of the 2009 Manual on Uniform Traffic Control Devices (MUTCD) and Virginia Supplement to the 2009 MUTCD.

In addition to the turning movement counts, crash history at the study intersection was obtained to evaluate Warrant 7 – Crash Experience. There were four crashes of a type susceptible to correction by signalization occurred at this intersection during a 12-months period from February 1, 2020 to January 31, 2021. Section 4C.08 of the 2009 MUTCD states that a traffic control signal shall be considered if "*Five or more reported crashes, of types susceptible to correction by a traffic control signal, have occurred within a 12-month period, each crash involving personal injury or property damage apparently exceeding the applicable requirements for a reportable crash.*" Therefore, a traffic signal is not warranted at the study intersection based on the crash experience.

A site visit was conducted at the study intersection on June 23, 2021 during the afternoon peak hour. No significant congestion or delay was observed during the site visit.

Field Review

A field review was conducted for the study intersection on June 23, 2021. Following characteristics were observed during the field visit:

- The intersection is conspicuous for both directions of traffic on the major road (Rte. 17).
- For Rte. 245 approach, the available intersection sight distance to right (SDR) is more than the minimum requirement of 750 ft. Additionally, the available intersection sight distance to left (SDL) is also more than the minimum requirement of 650 ft.
- For Rte. 703 approach, the available SDR and SDL are slightly less than the minimum requirements.
- The intersection has limited visibility for traffic approaching from both Rte. 245 and Rte. 703 approaches. There are existing stop ahead warning signs on these approaches to compensate for the limited visibility and warn approaching vehicles.
- Damaged pavement in the median opening area.

A list of images exhibiting the existing field conditions of the study intersections are shown in Appendix A.

Conclusions and Recommendations

Based on the collected turning movement counts and the crash experience, a traffic signal is not warranted at the study intersection. The crash analysis revealed that the left-turning traffic from Rte. 245 was involved in the majority of the crashes at the study intersection. However, the available intersection sight distance is more than the minimum required and these crashes are unlikely to be mitigated by any low cost countermeasures such as signing and pavement markings. A preliminary screening for alternative intersections using VJuST tool suggested that the modification of this intersection to Median U-Turns is likely to provide better safety and operational benefits over other intersection types.

To improve the overall safety at the study intersection, the damaged pavement on the median opening area, as shown in Figure 2, is recommended to be repaired. Additionally, trees are recommended to trimmed/removed within the marked areas shown in Figure 3.

Figure 2. Damaged pavement to be repaired

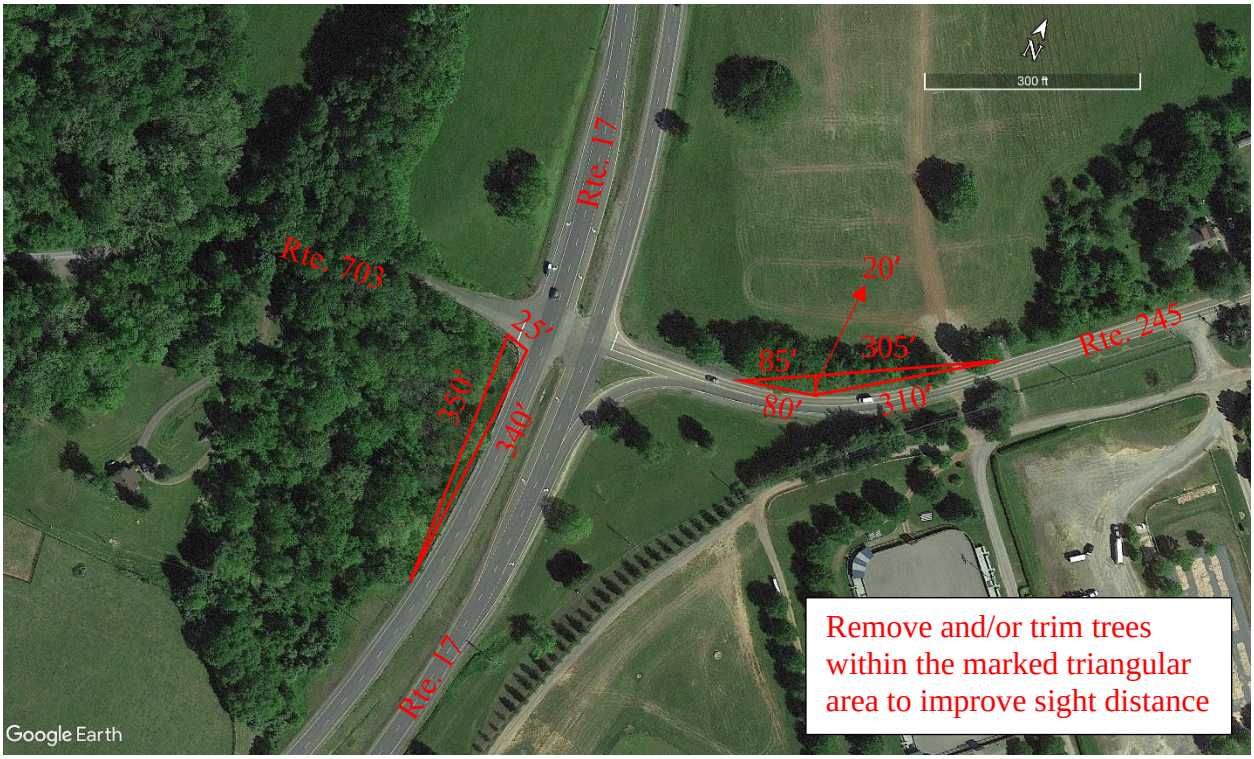


Figure 3. Recommendations for tree trimming/removal

Study Name: Rte. 17 and 245 Signal Warrant Study
Study Date : 7/23/2021

Signal Warrants - Summary

Major Street Approaches

Northbound: Rte. 17
Number of Lanes : 2+

Total Approach Volume: 5,733

Southbound: Rte. 17
Number of Lanes :2+

Total Approach Volume: 6,339

Minor Street Approaches

Eastbound: Rte. 703
Number of Lanes :1

Total Approach Volume: 53

Westbound: Rte. 245
Number of Lanes :1

Total Approach Volume: 824

Warrant Summary (Urban Values Apply)

Warrant 1 - Eight Hour Vehicular Volumes.....**Not Satisfied**

Warrant 1A - Minimum Vehicular Volume.....**Not Satisfied**
Required volumes reached for 1 hours, 8 are needed

Warrant 1B - Interruption of Continuous Traffic.....**Not Satisfied**
Required volumes reached for 5 hours, 8 are needed

Warrant 1C - Combination of Warrants.....**Not Satisfied**
Required 1A volumes reached for 2 hours, 8 are needed
Required 1B volumes reached for 7 hours, 8 are needed

Warrant 2 - Four Hour Volumes.....**Not Satisfied**
Number of hours (3) volumes exceed minimum < minimum required (4).

Warrant 3 - Peak Hour.....**Satisfied**

Warrant 3A - Peak Hour Delay.....**Satisfied**
Number of one hour periods (10) volumes exceed minimum >= required (1). Delay data not evaluated.

Warrant 3B - Peak Hour Volumes.....**Not Satisfied**
Volumes do not exceed minimums for any one hour period.

Warrant 4 - Pedestrian Volumes.....**Not Evaluated**

Warrant 5 - School Crossing.....**Not Evaluated**

Warrant 6 - Coordinated Signal System.....**Not Evaluated**

Warrant 7 - Crash Experience.....**Not Satisfied**
Number of accidents (4) is less than minimum (5). Volume minimums are not met.

Warrant 8 - Roadway Network.....**Not Evaluated**

Warrant 9 - Intersection Near a Grade Crossing.....**Not Evaluated**

Study Name: Rte. 17 and 245 Signal Warrant Study

Study Date : 7/23/2021

Warrant 1A - Minimum Volumes

Description

Intended for sites where the volume of intersecting traffic is the principal reason for consideration of a signal installation.

Summary

Only 1 one hour periods meet minimums.
Warrant is NOT met.

Site Data Required

Rural Settings Apply = **False**
Number of Major Lanes = **2 or more**
Number of Minor Lanes = **1**

Volume Requirements

Veh/Hr Major = **600**

Veh/Hr Minor = **150**

	Major Road Rte. 17					Minor Road Rte. 703		
Time	Major NB	+	Major SB	=	Total	Minor EB	Minor WB	Met?
15:15 - 16:15	587	+	693	=	1280	3	151	Yes
16:15 - 17:15	548	+	738	=	1286	3	136	No
15:00 - 16:00	572	+	704	=	1276	6	145	No
14:45 - 15:45	563	+	694	=	1257	4	134	No
16:30 - 17:30	526	+	699	=	1225	5	111	No
16:45 - 17:45	517	+	661	=	1178	5	103	No
14:30 - 15:30	516	+	646	=	1162	6	108	No
07:30 - 08:30	549	+	597	=	1146	4	76	No
07:45 - 08:45	551	+	585	=	1136	6	71	No
08:00 - 09:00	520	+	579	=	1099	7	64	No
07:15 - 08:15	523	+	566	=	1089	3	59	No
14:15 - 15:15	503	+	578	=	1081	7	98	No
17:00 - 18:00	466	+	587	=	1053	6	87	No
08:15 - 09:15	532	+	518	=	1050	6	48	No
13:30 - 14:30	486	+	536	=	1022	3	72	No
07:00 - 08:00	555	+	466	=	1021	2	48	No
14:00 - 15:00	469	+	542	=	1011	5	92	No
13:45 - 14:45	465	+	532	=	997	5	80	No
11:45 - 12:45	456	+	525	=	981	7	53	No
08:30 - 09:30	484	+	495	=	979	5	30	No
06:45 - 07:45	521	+	448	=	969	2	36	No
13:00 - 14:00	455	+	510	=	965	2	62	No
13:15 - 14:15	459	+	505	=	964	2	66	No
12:15 - 13:15	427	+	536	=	963	7	60	No
11:30 - 12:30	457		499		956	6	40	No

Study Name: Rte. 17 and 245 Signal Warrant Study

Study Date : 7/23/2021

Warrant 1B - Interruption of Continuous Traffic

Description

Intended for sites where the volume of the major street is so heavy that traffic on the minor street suffers excessive delay or hazard.

Summary

Only 5 one hour periods meet minimums.
Warrant is NOT met.

Site Data Required

Rural Settings Apply = **False**
Number of Major Lanes = **2 or more**
Number of Minor Lanes = **1**

Volume Requirements

Veh/Hr Major = **900**

Veh/Hr Minor = **75**

	Major Road Rte. 17					Minor Road Rte. 703		
Time	Major NB	+	Major SB	=	Total	Minor EB	Minor WB	Met?
14:45 - 15:45	563	+	694	=	1257	4	134	Yes
15:45 - 16:45	574	+	682	=	1256	4	154	Yes
16:45 - 17:45	517	+	661	=	1178	5	103	Yes
07:30 - 08:30	549	+	597	=	1146	4	76	Yes
13:45 - 14:45	465	+	532	=	997	5	80	Yes
07:15 - 08:15	523	+	566	=	1089	3	59	No
13:30 - 14:30	486	+	536	=	1022	3	72	No
07:00 - 08:00	555	+	466	=	1021	2	48	No
11:45 - 12:45	456	+	525	=	981	7	53	No
08:30 - 09:30	484	+	495	=	979	5	30	No
06:45 - 07:45	521	+	448	=	969	2	36	No
13:00 - 14:00	455	+	510	=	965	2	62	No
13:15 - 14:15	459	+	505	=	964	2	66	No
12:15 - 13:15	427	+	536	=	963	7	60	No
11:30 - 12:30	457	+	499	=	956	6	40	No
12:00 - 13:00	420	+	532	=	952	6	62	No
08:45 - 09:45	466	+	483	=	949	3	24	No
12:45 - 13:45	428	+	516	=	944	5	59	No
12:30 - 13:30	412	+	526	=	938	7	60	No
11:15 - 12:15	438	+	488	=	926	6	42	No
11:00 - 12:00	451	+	474	=	925	7	41	No
09:00 - 10:00	431	+	477	=	908	3	23	No
10:45 - 11:45	446	+	448	=	894	3	48	No
09:15 - 10:15	427	+	458	=	885	5	28	No
06:30 - 07:30	497		387		884	3	24	No

Study Name: Rte. 17 and 245 Signal Warrant Study

Study Date : 7/23/2021

Warrant 1C Combination of Warrants

Description

Intended for sites where the traffic volumes don't meet individual warrants but where Warrants 1A and 1B are both met to 80% of their stated values.

Summary

Only 2 hours meet 1A minimums.
Only 7 hours meet 1B minimums.
Warrant is NOT met.

Site Data Required

Rural Settings Apply =	**False**
Number of Major Lanes =	**2 or more**
Number of Minor Lanes =	**1**

Volume Requirements

Warrant	1A	1B
Veh/Hr Major =	**480**	**720**
Veh/Hr Minor =	**120**	**60**

Major Road	Minor Road
Rte. 17	Rte. 703

Time	Major NB	+	Major SB	=	Total	Minor EB	Minor WB	Met1A?
14:45 - 15:45	563	+	694	=	1257	4	134	Yes
15:45 - 16:45	574	+	682	=	1256	4	154	Yes
16:45 - 17:45	517	+	661	=	1178	5	103	No
14:30 - 15:30	516	+	646	=	1162	6	108	No
07:30 - 08:30	549	+	597	=	1146	4	76	No
07:45 - 08:45	551	+	585	=	1136	6	71	No
08:00 - 09:00	520	+	579	=	1099	7	64	No
07:15 - 08:15	523	+	566	=	1089	3	59	No
14:15 - 15:15	503	+	578	=	1081	7	98	No
17:00 - 18:00	466	+	587	=	1053	6	87	No
08:15 - 09:15	532	+	518	=	1050	6	48	No
13:30 - 14:30	486	+	536	=	1022	3	72	No

Time	Major NB	+	Major SB	=	Total	Minor EB	Minor WB	Met1B?
16:00 - 17:00	579	+	731	=	1310	2	141	Yes
15:00 - 16:00	572	+	704	=	1276	6	145	Yes
07:30 - 08:30	549	+	597	=	1146	4	76	Yes
17:00 - 18:00	466	+	587	=	1053	6	87	Yes
14:00 - 15:00	469	+	542	=	1011	5	92	Yes
13:00 - 14:00	455	+	510	=	965	2	62	Yes
12:00 - 13:00	420	+	532	=	952	6	62	Yes
07:15 - 08:15	523	+	566	=	1089	3	59	No
07:00 - 08:00	555	+	466	=	1021	2	48	No
11:45 - 12:45	456	+	525	=	981	7	53	No
08:30 - 09:30	484	+	495	=	979	5	30	No
06:45 - 07:45	521	+	448	=	969	2	36	No

Study Name: Rte. 17 and 245 Signal Warrant Study

Study Date : 7/23/2021

Warrant 2 - Four Hour Volumes

Description

Intended for sites where the volume of intersecting traffic during any four hours of the day is the principal reason for consideration of a signal installation.

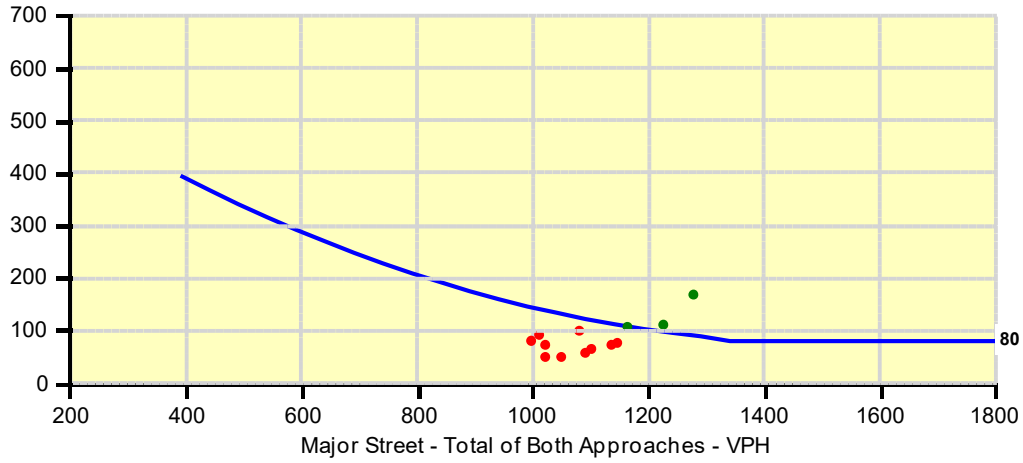
Summary

Only 3 one hour periods meet minimums.
Warrant is NOT met.

Site Data Required

Rural Settings Apply =	**False**
Number of Major Lanes =	**2 or more**
Number of Minor Lanes =	**1**

	Major Road Rte. 17					Minor Road Rte. 703		
Time	Major NB	+	Major SB	=	Total	Minor EB	Minor WB	Met?
15:30 - 16:30	605	+	672	=	1277	3	169	Yes
16:30 - 17:30	526	+	699	=	1225	5	111	Yes
14:30 - 15:30	516	+	646	=	1162	6	108	Yes
07:30 - 08:30	549	+	597	=	1146	4	76	No
07:45 - 08:45	551	+	585	=	1136	6	71	No
08:00 - 09:00	520	+	579	=	1099	7	64	No
07:15 - 08:15	523	+	566	=	1089	3	59	No
14:15 - 15:15	503	+	578	=	1081	7	98	No
08:15 - 09:15	532	+	518	=	1050	6	48	No
13:30 - 14:30	486	+	536	=	1022	3	72	No
07:00 - 08:00	555	+	466	=	1021	2	48	No
							92	No



Study Name: Rte. 17 and 245 Signal Warrant Study

Study Date : 7/23/2021

Warrant 3A - Peak Hour Delay

Description

Intended for sites where for one hour of the day minor street traffic suffers undue traffic delay entering or crossing the major street.

Summary

45 one hour periods meet minimums.
Warrant IS met.

Site Data Required

Number of Minor Lanes =**1**

Volume and Delay Requirements

Veh/Hr All Approaches = **800**
Veh/Hr Minor = **100**
Total Delay (Veh-Hrs) = **4**

	Major Road Rte. 17					Minor Road Rte. 703			
Time	Total of All Approaches	Met?	Minor EB	Delay EB	Met?	Minor WB	Delay WB	Met?	Warrant Met?
16:00 - 17:00	1453	Yes	2	-	---	141	-	Yes	Yes
15:30 - 16:30	1449	Yes	3	-	---	169	-	Yes	Yes
15:15 - 16:15	1434	Yes	3	-	---	151	-	Yes	Yes
15:00 - 16:00	1427	Yes	6	-	---	145	-	Yes	Yes
16:15 - 17:15	1425	Yes	3	-	---	136	-	Yes	Yes
15:45 - 16:45	1414	Yes	4	-	---	154	-	Yes	Yes
14:45 - 15:45	1395	Yes	4	-	---	134	-	Yes	Yes
16:30 - 17:30	1341	Yes	5	-	---	111	-	Yes	Yes
16:45 - 17:45	1286	Yes	5	-	---	103	-	Yes	Yes
14:30 - 15:30	1276	Yes	6	-	---	108	-	Yes	Yes
07:30 - 08:30	1226	Yes	4	-	---	76	-	No	No
07:45 - 08:45	1213	Yes	6	-	---	71	-	No	No
14:15 - 15:15	1186	Yes	7	-	---	98	-	No	No
08:00 - 09:00	1170	Yes	7	-	---	64	-	No	No
07:15 - 08:15	1151	Yes	3	-	---	59	-	No	No
17:00 - 18:00	1146	Yes	6	-	---	87	-	No	No
14:00 - 15:00	1108	Yes	5	-	---	92	-	No	No
08:15 - 09:15	1104	Yes	6	-	---	48	-	No	No
13:30 - 14:30	1097	Yes	3	-	---	72	-	No	No
13:45 - 14:45	1082	Yes	5	-	---	80	-	No	No
07:00 - 08:00	1071	Yes	2	-	---	48	-	No	No
11:45 - 12:45	1041	Yes	7	-	---	53	-	No	No
13:15 - 14:15	1032	Yes	2	-	---	66	-	No	No
12:15 - 13:15	1030	Yes	7	-	---	60	-	No	No
13:00 - 14:00	1029	Yes	2	-	---	62	-	No	No

Study Name: Rte. 17 and 245 Signal Warrant Study

Study Date : 7/23/2021

Warrant 3B - Peak Hour Volumes

Description

Intended for sites where the volume of intersecting traffic during one hour of the day is the principal reason for consideration of a signal installation.

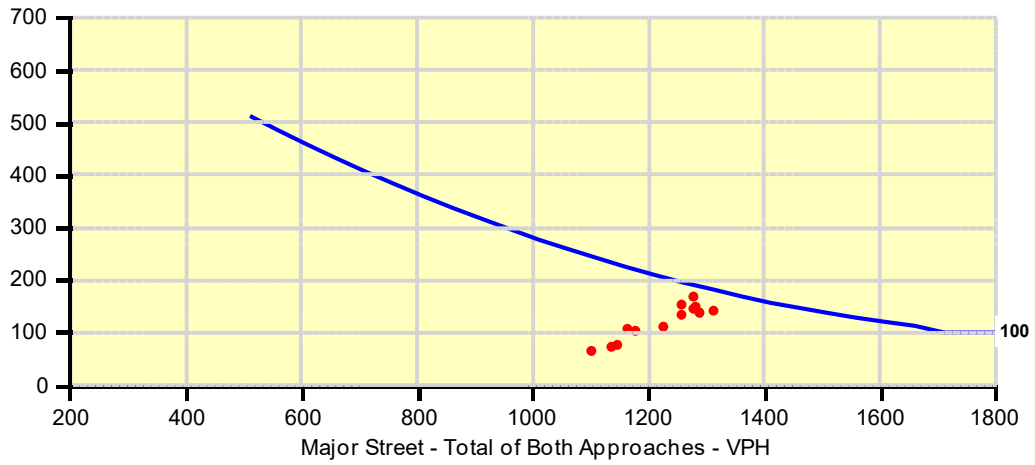
Summary

Only 0 one hour periods meet minimums.
Warrant is NOT met.

Site Data Required

Rural Settings Apply =	**False**
Number of Major Lanes =	**2 or more**
Number of Minor Lanes =	**1**

	Major Road Rte. 17					Minor Road Rte. 703		
Time	Major NB	+	Major SB	=	Total	Minor EB	Minor WB	Met?
16:00 - 17:00	579	+	731	=	1310	2	141	No
16:15 - 17:15	548	+	738	=	1286	3	136	No
15:15 - 16:15	587	+	693	=	1280	3	151	No
15:30 - 16:30	605	+	672	=	1277	3	169	No
15:00 - 16:00	572	+	704	=	1276	6	145	No
14:45 - 15:45	563	+	694	=	1257	4	134	No
15:45 - 16:45	574	+	682	=	1256	4	154	No
16:30 - 17:30	526	+	699	=	1225	5	111	No
16:45 - 17:45	517	+	661	=	1178	5	103	No
14:30 - 15:30	516	+	646	=	1162	6	108	No
07:30 - 08:30	549	+	597	=	1146	4	76	No
							71	No



Study Name: Rte. 17 and 245 Signal Warrant Study

Study Date : 7/23/2021

Warrant 7 - Crash Experience

Description

Intended for sites where the frequency of correctible crashes in the past 12 months is the primary motivation for installing a traffic signal.

Summary

Number of crashes does not meet minimum.
Pedestrian volumes do not meet the 80% criteria.
War 1A or 1B volumes do not meet the 80% criteria.
Warrant is NOT met.

Site Data Required

Number of crashes in last 12 months = **4**

Rural Settings Apply = **False**
Number of Major Lanes = **2 or more**
Number of Minor Lanes = **1**

Crash and Volume Requirements

Minimum number of crashes = **5**

Veh/Hr Major: War 1A = **480** War 1B = **720**

Veh/Hr Minor: War 1A = **120** War 1B = **60**

Volume and Pedestrian Data

Hours data meets 80% requirements of Warrant 1A (8 needed) **2** Met? **No**
Hours data meets 80% requirements of Warrant 1B (8 needed) **7** Met? **No**
Hours data meets 80% requirements of Warrant 4 (4,1 needed) **0** **0** Met? **No**

Major Road	Minor Road
Rte. 17	Rte. 703

Warrant 1A Details

Time	Major NB	+	Major SB	=	Total	Minor EB	Minor WB	Met1A?
14:45 - 15:45	563	+	694	=	1257	4	134	Yes
15:45 - 16:45	574	+	682	=	1256	4	154	Yes
16:45 - 17:45	517	+	661	=	1178	5	103	No
14:30 - 15:30	516	+	646	=	1162	6	108	No
07:30 - 08:30	549	+	597	=	1146	4	76	No
07:45 - 08:45	551	+	585	=	1136	6	71	No
08:00 - 09:00	520	+	579	=	1099	7	64	No
07:15 - 08:15	523	+	566	=	1089	3	59	No
14:15 - 15:15	503	+	578	=	1081	7	98	No
17:00 - 18:00	466	+	587	=	1053	6	87	No
08:15 - 09:15	532	+	518	=	1050	6	48	No
13:30 - 14:30	486		536		1022	3	72	No

Warrant 1B Details

Time	Major NB	+	Major SB	=	Total	Minor EB	Minor WB	Met1B?
16:00 - 17:00	579	+	731	=	1310	2	141	Yes
15:00 - 16:00	572	+	704	=	1276	6	145	Yes
07:30 - 08:30	549	+	597	=	1146	4	76	Yes
17:00 - 18:00	466	+	587	=	1053	6	87	Yes
14:00 - 15:00	469	+	542	=	1011	5	92	Yes
13:00 - 14:00	455	+	510	=	965	2	62	Yes
12:00 - 13:00	420	+	532	=	952	6	62	Yes
07:15 - 08:15	523	+	566	=	1089	3	59	No
07:00 - 08:00	555	+	466	=	1021	2	48	No
11:45 - 12:45	456	+	525	=	981	7	53	No
08:30 - 09:30	484	+	495	=	979	5	30	No
06:45 - 07:45	521		448		969	2	36	No

Study Name: Rte. 17 and 245 Signal Warrant Study

Study Date : 7/23/2021

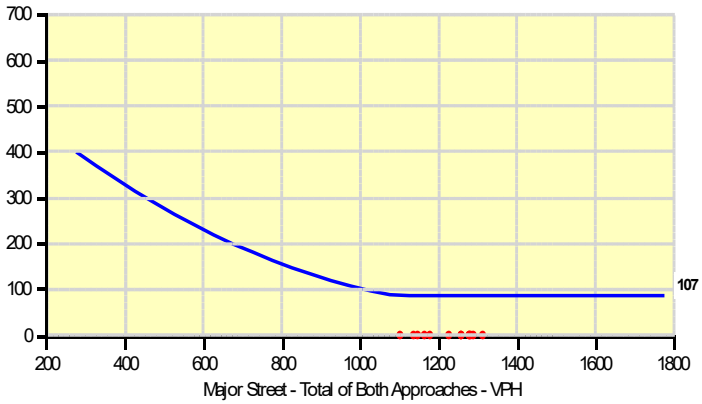
Warrant 7 - Crash Experience

Major Road

Rte. 17

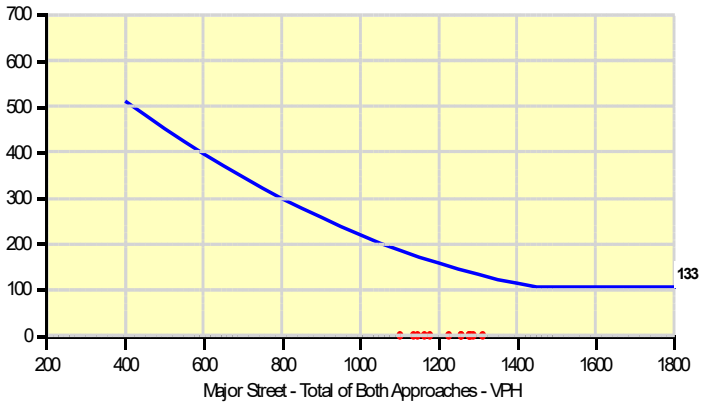
80% of Warrant 4 - 4 Hr Pedestrian Data

Time	NB Vehs	+	SB Vehs	=	Total Vehs	NB Peds	+	SB Peds	=	Ped Total	Met?
16:00 - 17:00	579	+	731	=	1310	0	+	0	=	0	No
16:15 - 17:15	548	+	738	=	1286	0	+	0	=	0	No
15:15 - 16:15	587	+	693	=	1280	0	+	0	=	0	No
15:30 - 16:30	605	+	672	=	1277	0	+	0	=	0	No
15:00 - 16:00	572	+	704	=	1276	0	+	0	=	0	No
14:45 - 15:45	563	+	694	=	1257	0	+	0	=	0	No
15:45 - 16:45	574	+	682	=	1256	0	+	0	=	0	No
16:30 - 17:30	526	+	699	=	1225	0	+	0	=	0	No
16:45 - 17:45	517	+	661	=	1178	0	+	0	=	0	No
14:30 - 15:30	516	+	646	=	1162	0	+	0	=	0	No
07:30 - 08:30	549	+	597	=	1146	0	+	0	=	0	No
07:45 - 08:45	551		585		1136	0		0		0	No



80% of Warrant 4 - 1 Hr Pedestrian Data

Time	NB Vehs	+	SB Vehs	=	Total Vehs	NB Peds	+	SB Peds	=	Ped Total	Met?
16:00 - 17:00	579	+	731	=	1310	0	+	0	=	0	No
16:15 - 17:15	548	+	738	=	1286	0	+	0	=	0	No
15:15 - 16:15	587	+	693	=	1280	0	+	0	=	0	No
15:30 - 16:30	605	+	672	=	1277	0	+	0	=	0	No
15:00 - 16:00	572	+	704	=	1276	0	+	0	=	0	No
14:45 - 15:45	563	+	694	=	1257	0	+	0	=	0	No
15:45 - 16:45	574	+	682	=	1256	0	+	0	=	0	No
16:30 - 17:30	526	+	699	=	1225	0	+	0	=	0	No
16:45 - 17:45	517	+	661	=	1178	0	+	0	=	0	No
14:30 - 15:30	516	+	646	=	1162	0	+	0	=	0	No
07:30 - 08:30	549	+	597	=	1146	0	+	0	=	0	No
07:45 - 08:45	551		585		1136	0		0		0	No



VDOT Junction Screening Tool

Results Worksheet

VJuST
VDOT Junction Screening Tool

General Information	
Project Title:	Intersection of Rte. 17 and Rte. 245/Rte. 703
EW Facility:	Rte. 245/Rte. 703
NS Facility:	Rte. 17
Date:	July 28, 2021

Volumes (veh/hr)	U-Turn / Left	Through	Right
Eastbound	2	0	0
Westbound	3	2	136
Northbound	2	571	6
Southbound	67	661	3

General Instructions: All intersection and interchange configurations have a default assumption of one exclusive lane per movement. No results shall be interpreted until the user has verified the lane configurations on each worksheet.

Intersection Results

Type	Dir	Maximum V/C (Congestion)	Accommodation Compared to Conventional (Pedestrian)	Weighted Total Conflict Points (Safety)	Notes
Bowtie	-	0.34	+	24	
Center Turn Overpass	-	0.34	+	32	
Echelon	-	0.51	+	28	
Full Displaced Left Turn	-	0.30	-	40	
Median U-Turn	-	0.34	+	20	
Partial Displaced Left Turn	-	0.57	-	44	
Partial Median U-Turn	-	0.31	+	28	
Quadrant Roadway	N-W	0.34		40	
	N-E	0.31		40	
	S-E	0.36		40	
	S-W	0.36		40	
Restricted Crossing U-Turn	-	0.52		20	
Single Loop	-	0.24	-	28	
Split Intersection	-	0.36		36	
Thru-Cut	-	0.54		28	
50 Mini Roundabout	-	0.83		8	
75 Mini Roundabout	-	0.82		8	
Roundabout	-	0.60		8	

*The continuous green-T is the only three-legged innovative intersection in this tool. To compare the continuous green-T to other innovative intersections, conflicts corresponding with the fourth leg must be removed. This has been done for the conventional intersection. Conflict point diagrams for three-legged and four-legged conventional intersections have been provided on the conventional intersection worksheet for reference.

Interchange Results					
		Congestion	Pedestrian	Safety	Notes
Type	Dir	Maximum V/C	Accommodation Compared to Traditional Diamond	Weighted Total Conflict Points	

Information	
Congestion	The maximum v/c ratio represents the worst v/c of all zones that make up an intersection.
Pedestrian	Compares the potential of each design to accommodate pedestrians based on safety, wayfinding, and delay. Potential is qualitatively defined as better (+), similar (blank cell), or worse (-) than a conventional intersection or traditional diamond interchange.
Safety	Weighted Total = (2 x Crossing Conflicts) + Merging Conflicts + Diverging Conflicts

Appendix A. Field Photos

Figure A.1 SDL for Rte. 245 approach

Figure A.2 SDR for Rte. 245 approach

Figure A.3 Sight distance obstruction for traffic approaching from Rte. 245

Figure A.4 Stop ahead warning for traffic approaching from Rte. 245

Figure A.5 SDL for Rte. 703 approach

Figure A.6 SDR for Rte. 703 approach

Figure A.7 Stop ahead warning for traffic approaching from Rte. 703

Figure A.8 View of intersection to traffic approaching from northbound on Rte. 17

Figure A.9 View of intersection to traffic approaching from southbound on Rte. 17

Figure A.10 Damaged pavement on the median opening area